



Newsletter

Volume 14, Number 3
May - June 1997

This summer at IES ...

... at the **Gifford House Visitor and Education Center**, pause at the bulletin board to read the week's *Horticultural Highlights*. This posting is especially interesting during the summer, when horticultural assistant Bill Relyea takes a look at what's in bloom from botanical, ecological, medicinal and mythological angles. A compilation of Mr. Relyea's contributions since 1994 will soon be available for reference.

... at the **Perennial Garden**, sundews, sphagnum moss and varieties of pitcher plant grow in a new mini-bog pot. July is peak perennial season, while annuals are at their best in August.

... if green is your favorite color, visit the **Fern Glen**: rock ferns, forest ferns, wetland ferns, tiny and large ferns, in every shade of green. And watch for the green frogs that sound an alarm and dive into the pond when visitors near.

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Cary Conference VII: Successes, Limitations and Frontiers in Ecosystem Science

What have we, as ecologists, done well?... What has held us back?... What are the great challenges for the next 10 to 20 years?...
These questions formed the framework of the 1997 Cary Conference, the seventh in a series of biennial meetings held at the Institute of Ecosystem Studies to consider major issues in ecology.

The theme of Cary Conference VII developed from meetings last fall, when IES ecologists Peter M. Groffman and Michael L. Pace presented the thesis that progress in ecosystem ecology has been driven by the emergence of environmental problems that could not be addressed with existing tools. From that thesis, the theme for the conference developed: "Recognition of the relationships between environmental problems and progress in ecosystem ecology may help determine the factors that have led to successes in this field as well as highlight what limits our progress. It also may improve our ability to predict and address topics at the frontiers of our science."

For Cary Conference VII, held from May 6-8, Drs. Groffman and Pace commissioned leading thinkers in the field to give talks addressing topics related to "successes", "limitations", and "frontiers" in ecosystem science — issues that should be important to the field over the next several decades.

Consistent with the conference theme of environmental problems as drivers of ecosystem science, each "success" case

study considered how research had 1) increased scientific understanding of ecosystem structure and function (the 'basic science' criterion), and 2) provided insight into and solutions to environmental problems (the practical or 'applied science' criterion). The latter was subdivided into two questions: Have we generated the scientific understanding necessary to solve a problem? Has this knowledge been used by society?

Of the success stories presented at the conference, all met, to some degree, the basic science criterion, and most met the first component of the applied science criterion as well. There is, however, wide variation in the nature and extent of success in implementation. This highlighted the need for stronger interaction between ecosystem scientists and management and political institutions.

IES forest ecologist Dr. Kathleen C. Weathers was one of the presenters who addressed a "success", describing how investigations of the linkage between atmospheric pollutants, atmospheric processes and ecosystem response have led to identification, understanding and predictive models of the effects of air pollutants such as acid precipitation on soil and surface waters. The session on "limitations" focused on issues raised concerning the uneven success in implementation. Among the speakers was Dr. Carl J. Walters, from the University of British Columbia, who offered ways in which ecosystem scientists could be more

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United States Under Secretary of State for Global Affairs Timothy E. Wirth spoke to conference participants and guests about global warming.

MOLLY AHEARN

IES "Best Project" Award

Mr. Michael McCann, a fifth grader at St. Denis-St. Columba School in Hopewell Junction, N.Y., was the recipient of the Institute of Ecosystem Studies' 1997 award for "Best Project in Environmental Science and Ecology" at the Dutchess County Regional Science Fair. IES ecologist Dr. Gary Lovett, who coordinates Institute participation in the fair each year, said that Mr. McCann's project, *Petroleum Pollution and Plants*, caught the attention of the IES judges because it reflected careful observation and experimentation.

Using bean seeds and seedlings, Mr. McCann studied the effects of kerosene, gasoline, new motor oil and used motor oil on germination and young plants. By doing experiments to simulate the effects of both a large and a small petroleum pollution incident, he found that kerosene and gasoline were the most toxic of the products he tested, and that there were no effective methods of removing them from the soil once a spill had occurred. He was a winner at his school's science fair and went on to the regional competition.

At a scientific seminar early in May, Institute Director Dr. Gene Likens presented Mr. McCann with a Certificate of Recognition and a \$50 award. Mr. McCann's parents and teacher were present for the ceremony, after which the family toured the Institute.



Dr. Gary Lovett, coordinator of the IES judges for the Dutchess County Regional Science Fair, congratulates Michael McCann. Mr. McCann is the winner of the Institute's Best Project in Environmental Science and Ecology Award for 1997.

Institute staff serving as judges for the IES award at the Dutchess County Regional Science Fair were Drs. Stuart Findlay, Gary Lovett and Cathy Wigand and Mr. Greg Lampman.

Honorable Mention Certificates were sent to:

Patrick Quinn, 6th grade, St. Martin de Porres School, Poughkeepsie, N.Y.: *What*

section of my town has the most pollution in the form of airborne dust?

Michael Gross, 5th grade, St. Denis-St. Columba School, Hopewell Junction, N.Y.: *Plants are dying out there.*

Supriya Rao, 10th grade, Our Lady of Lourdes High School, Poughkeepsie, N.Y.: *Mutant microbes: A hope for the environment and medicine?*

Cary Conference, *from page 1*

successful in applying what they learn to the understanding and solution of critical environmental problems and discussed the barriers to partnerships with ecosystem managers.

A number of participants addressed "frontiers" in ecosystem science. One speaker was Dr. Stephen R. Carpenter, University of Wisconsin, who does large scale ecosystem experiments. Dr. Carpenter emphasized the importance of studying whole watersheds, lakes, streams, patches of ocean water, forests and fields in order to gain insights into the functioning of ecosystems. Another presenter, Dr. Peter M. Vitousek of Stanford University, spoke of how ecosystem processes change over millions of years. He argued for the need to integrate studies of ecosystem processes driven by rapid phenomena (e.g., microbial metabolism) and those driven by slower phenomena (e.g., weathering of rock).

United States Under Secretary of State

for Global Affairs Timothy E. Wirth, keynote speaker at an evening reception, built on the idea of the relationship between environmental problems and the development of ecosystem science. He charged the scientists to use the evidence they have gathered to make it clear to the world's policy makers why global climate change — the warming of Earth resulting from an increasing build-up of atmospheric carbon dioxide released during the burning of fossil fuels — is an issue that must be faced and dealt with. He praised scientists for coming to consensus about the existence of global warming, and rejoined them to go further in describing its considerable consequences to policy makers and the general public.

The 80 conference participants agreed on a number of concerns. There is a need for ecosystem scientists to work more closely with professionals in such diverse disciplines as the social sciences and meteorology. Modeling, field work and management studies can make signifi-

cant contributions to ecosystem science. And there was strong consensus that education plays a crucial role in the future of ecosystem science, both in training the next generation of scientists and in making science understandable to the public.

Proceedings of Cary Conference VII, comprising the presentations on successes, limitations and frontiers in ecosystem science as well as a synthesis of the conference as a whole, will be published in early 1998 by Springer-Verlag.

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Cary Conferences have been held at the Institute every other May since 1985, each focusing on a different theme. Their purpose, unlike that of many scientific meetings, is to consider the process of science, rather than the detailed content, to help integrate and advance the discipline of ecology. Over 500 scientists from around the world have participated in these conferences.

Thinking Aloud Together

People who are good thinkers can generate ideas, think critically about them, and build on the thinking of others. They can support their ideas with evidence, and identify and improve upon flaws in their reasoning. How do these thinking skills, which are key to scientific practice, develop in children and adolescents? This is a question that IES educational research and development specialist Kathleen Hogan investigated during a year-long collaboration with the Warring Magnet Academy of Science and Technology in Poughkeepsie, N.Y.

The context for Ms. Hogan's study of the development of scientific reasoning was provided by the Eco-Inquiry curriculum that she developed and published (see box). In September 1996, working with Warring Academy's science coordinator Nancy Silverman and teacher Leslie Williams, she and Catherine Corey, Eco-Inquiry project coordinator, began a year-long unit with an ecology theme. They taught two sessions each week to Mr. Williams' class of twenty fifth-graders, introducing Eco-Inquiry lessons on decomposition and nutrient cycling. IES ecologists joined the team effort as well. Dr. Steward Pickett and graduate student Mary Cadenasso spent an afternoon in the classroom showing the "tools of their trade" — field notebooks, plastic bags with soil samples, tree buds and twigs — and answering questions about what they do and how they work together as scientists. And, on another occasion, Dr. Patrick

Bohlen fascinated the students with the intricacies of earthworm ecology.

Finally, because ecology instruction would not be complete without a field component, the instructors incorporated several outdoor activities into the program. Last fall, the students buried leaves that they dug up in spring for a study of decomposition. They also made compost to bury in the schoolyard, adding nutrients to the soil with the hoped-for result of beautifying the school's grounds.

There is a growing need to understand how cultural differences play a role in children's learning. Warring Academy was selected for this collaborative program not only because of its focus on science and its relative proximity to IES, but also because of its urban setting. In research done previously in New York City schools, Ms. Hogan found that urban students, many of whom are not as familiar with nature and the out-of-doors as are their rural-dwelling counterparts, may approach an ecological study with a different set of prior ideas¹. Cultural differences also are reflected in the way children interact and communicate, and these differences have an impact on

¹ "Representing Students' Thinking about Nutrient Cycling in Ecosystems: Bidimensional Coding of a Complex Topic", K. Hogan and J. Fisherkeller, published in the *Journal of Research in Science Teaching*, Vol. 33, No. 9, pp. 941-970, 1996.

scientific collaboration. "Thinking aloud together" is a phrase she uses to describe the process of collaborative reasoning, or how children co-construct ideas and make sense together of science phenomena.

The program at Warring Academy was one of mutual benefit. The students gained knowledge of ecology and acquired abilities in scientific thinking and communication. Warring Academy's science program was strengthened through Mr. Williams' participation in the Eco-Inquiry curriculum. Finally, Ms. Hogan broadened the scope of her own research by tracing the learning of a single classroom of students as it unfolded over the course of nine months.

Ms. Hogan is studying how the students gained an understanding of the concepts of decomposition and nutrient cycling and how they developed skills in scientific reasoning. Throughout the year, she and Ms. Corey made videotapes and audiotapes of the ecology lessons. Then, in the final weeks of the school year, she met with the students individually to find out what they learned since September, not just about the facts of science but also about the processes involved in *doing* science. Her findings will contribute to her on-going research on collaborative scientific reasoning at the middle school level. Her goal is to provide teachers with more knowledge about how to take advantage of students' social inclinations to maximize their science learning.



Warring Academy fifth graders studied decomposition and nutrient cycling as part of a year-long ecology unit. Here, they bury compost they made in the classroom. Left to right, teachers: Mr. Leslie Williams and IES educator Ms. Catherine Corey; and students: Durrell Dennis, Elsie DeFreitas and Fiamma Thompson.

Ms. Kathleen Hogan is the author of three publications designed to help encourage scientific understanding and thoughtful inquiry in students. *Eco-Inquiry: A guide to ecological learning experiences for the upper elementary/middle grades*, Rita (a novel, written for young people that shows that it can be fun and satisfying to think scientifically), and *Promoting Student Thinking: A Teacher's Guide to Linking Science and Literature Through Rita* are available from the IES Ecology Shop or from Kendall Hunt Publishing Co., telephone 1/800/228-0810.

Ms. Hogan also has recently co-edited a book with Dr. Michael Pressley (Department of Educational Psychology, Univ. at Albany, State Univ. of New York) on similar themes, for educators and researchers. *Scaffolding Student Learning: Instructional Approaches and Issues* is available from Brookline Books, telephone 1/800/666-2665.



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Calendar

CONTINUING EDUCATION

Audiotapes are now available for *Careers in Horticulture/Garden Communication*

a Continuing Education Program symposium, co-sponsored by IES and the Garden Writers Association of America, that was held on March 1, 1997. Titles include:

- *Cultivating the English Language* (S. Eddison)
- *Launching a Book* (T. Christopher)
- *From Pickaxing to Publishing* (N. Beaubaire)
- *Publishing Your Photos* (D. Kane)
- *Keep the Ground Game Going* (L. Sombke)
- *My Serendipitous Journey* (C.W. Barash)

Each tape is \$8.95, or order the whole set for \$48.95, a savings of \$4.75. Call 914/677-9643.

For a **Summer 1997** catalogue and program information, call the Continuing Education office at 914/677-9643. Programs during July and August include:

Landscape Design

- Aug. 2: **Quick Sketches of Landscapes**
- Aug. 9: **Ecosystem Management Using Prescribed Fire**
- Aug. 10: **The Critical Role of Mammals in Shaping Landscapes**
- Aug. 16: **Landscape Design for the Small Residential Site**
- Aug. 23: **Designing the Entrance**

Gardening

- July 19: **Native Ferns and Fern Allies**
- July 19: **Stone Wall Construction**
- July 26: **The Garden Beautiful: Architecture, Water and Hardscape**
- July 26: **Summer Wild Plant Identification**
- Aug. 3: **Pinching, Deadheading, Staking and More**
- Aug. 9: **Designing a Perennial Border for All Seasons**
- Aug. 16 & 23: **Fundamentals of Gardening**

Natural Science Illustration

- July 15-17: **Summer Gardens in Pastel**
- July 16-17: **Working as a Paid Illustrator: What You Need to Know**
- July 19-20: **Watercolors with Colored Pencil Overlay**
- July 22-24: **Watercolors in the Garden**

Continuing Education, continued:

Garden Photography

Aug. 2: **Garden Photography: Beds, Borders and Beyond**

Biology and Earth Science

Aug. 2: **Rare and Endangered Plants**
Aug. 9: **Butterflies and Other Delights**

Ecological Excursions

July 26: **Noah's Garden: An Ecological Model for Transforming the Suburban Landscape**
July 27: **Sharon Audubon Center**

Garden Tours

July 12: **More Private Connecticut Gardens**
July 15: **A Summer Tour of Stonecrop**

SUNDAY ECOLOGY PROGRAMS

Free public programs are held on the first or second Sunday of the month. Call 914/677-5359 to confirm the day's topic or, in case of poor weather, to learn the status of the day's program.
July 6: **Mammal Walk**, led by IES animal ecologist Dr. Richard Ostfeld

Aug. 3: To be announced

Sept. 7: **Pond Walk**, led by IES aquatic ecologist Dr. Michael Pace

- *We recommend that participants wear long pants tucked into socks and sturdy waterproof shoes.*

VOLUNTEER OPPORTUNITIES

For information on positions and benefits, call Ms. Su Marcy at 914/677-5359.

GREENHOUSE

The IES greenhouse, a year-round tropical plant paradise and a site for controlled environmental research, is open until 3:30 p.m. daily except public holidays. Admission is by free permit (see "HOURS").

HOURS

Summer hours: May 1 - September 30
Closed on public holidays.

Public attractions are open Mon. - Sat., 9 a.m.-6 p.m. & Sun. 1-6 p.m., with a free permit*. The IES Ecology Shop is open Mon.- Fri., 11 a.m.-5 p.m., Sat. 9 a.m.-5 p.m. & Sun. 1-5 p.m. (The shop is closed weekdays from 1-1:30 p.m.)

* *Free permits are required for visitors and are available at the IES Ecology Shop or the Education Program office daily until 5 p.m.*

IES ECOLOGY SHOP

New in the Shop ... tote bags ... 1998 pocket calendars ... notecards with herb, wildflower and songbird designs ... **for children ...** puzzles ... finger puppets ... **and in the Plant Room ...** gardening buckets ... coming soon: hummingbird feeders and food ... EZ diggers
Senior Citizens Days: 10% off on Wednesdays

•• Gift Certificates are available ••

MEMBERSHIP

Join the Institute of Ecosystem Studies. Benefits include subscription to the newsletter, member's rate for courses and excursions, a 10% discount on IES Ecology Shop purchases, and participation in a reciprocal admissions program. Individual membership: \$30; family membership: \$40. Call Ms. Janice Claiborne at 677-5343.

The Institute's Aldo Leopold Society

In addition to receiving the benefits listed above, members of The Aldo Leopold Society are invited guests at spring and fall IES science updates. Call Ms. Jan Mittan at 677-5343.

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